

ADDITIONAL NOTES ON VERONICA
ANAGALLIS-AQUATICA × CATENATA
(SCROPHULARIACEAE)

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Brooks (1976) reports and describes a sterile putative hybrid between *Veronica anagallis-aquatica* L. and *V. catenata* Pennell that was found growing with the presumed parents in central and western Nebraska. We would like to report the occurrence of this same hybrid in California and add information from the literature on studies of this hybrid in Europe.

There has been considerable confusion in the nomenclature of *Veronica catenata* that apparently hinders the dissemination of information on this species. In current major regional floras of the United States this species can be found under the names *V. catenata*, *V. comosa* Richter, *V. connata* Raf., and *V. salina* Schur., and much published work on the species in Europe, including studies on hybridization, is under *V. aquatica* Bernh. Burnett (1950) reviewed the nomenclatural history of this species and gave arguments for accepting *V. catenata* as the correct name. Much of the early work on *V. anagallis-aquatica* appears under the shortened name *V. anagallis* L. Omitted from Brooks' paper was a consideration of the wide distribution of both parental species in Eurasia in addition to North America (Pennell, 1935; Fernald, 1939; Hartl, 1968).

While Brooks' report is the first of which we are aware for the hybrid in North America, the author failed to mention that this hybrid, as pointed out in *Flora Europaea* (Walters & Webb, 1972) and other British and continental floras (e.g., Hartl, 1968), is well-known throughout much of Europe, sometimes forming large clones in streams. Our earliest reference to the hybrid goes back to Lackschewitz (1908), who described the intermediate-appearing hybrids in Latvia and illustrated the parents and hybrid with its aborted pollen grains. A name honoring Lackschewitz was given to the hybrid by Keller (1942): *Veronica* × *lackschewitzii*. Schlenker (1936) carried out an extensive program of artificial hybridization between the two species which resulted in numerous, mostly sterile F₁ plants and 33 morphologically diverse F₂ plants, of which one was selfed to produce F₃ plants that displayed considerable varia-

tion in fertility. Davis and Heywood (1963) point out that while *V. anagallis-aquatica* and *V. catenata* intergrade in continental Europe, they form sterile hybrids and remain separable in Great Britain, a situation which they attribute to differences in selection pressure, the hybrids having an advantage in one area and not in the other. Experimental work has been done recently in Great Britain by Marchant (1970) and some of his results are briefly summarized by Walters (1975).

In California, where it seems likely that both species are introduced, we have found hybridization between *Veronica anagallis-aquatica* and *V. catenata*. These species are spreading in California and the chances for their sympatric occurrences are increasing. We have found mixed populations of the two species in four localities in central and northern California, and hybrids occurred in one of these colonies: Siskiyou County: Shasta River, highway 99 bridge ca. 5 miles north of Yreka, 28 Aug. 1971 (*Heckard 2783*, JEPS). The hybrids displayed complete seed sterility and 97% of the pollen grains were aborted and non-staining (in lacto-phenol and cotton blue). Examination of microspore formation showed clusters of five to ten microspores of varying sizes indicating the occurrence of considerable meiotic irregularity. Pollen in the parents showed an insignificant 3–8% of aborted grains. Dr. Tsan-Iang Chuang has kindly supplied us with chromosome counts for both parents at the same locality as the hybrid. Both *V. anagallis-aquatica* (*Heckard 2781*, JEPS) and *V. catenata* (*Heckard 2782*, JEPS) have 18 pairs ($2n = 36$), which agrees with counts for these species in Europe. The few hybrid plants along the Shasta River grew intermingled with the two parental species at the edge of pools in the drying sand of the river margin. For the most part the morphological features of the hybrids and parental species are in agreement with those described by Brooks. Although Brooks used plant height as a distinguishing feature for the two parental species, we find that in California the variation in height is so great for each species that it would seem unsuitable for separating them. In fact, at the Shasta River locality, *V. catenata* happened to be taller, which conflicts with the Brooks data. One additional feature noted in the Shasta River hybrid was the size of corolla: 5–6 mm. broad which is intermediate between that of *V. anagallis-aquatica* (6–7 mm.) and *V. catenata* (4–5 mm.). Corolla color is the most useful feature for distinguishing the two parental species in the field: light

blue in *V. anagallis-aquatica* and pale pink in *V. catenata*. We did not get a record of flower color in the hybrid. Schlenker (1936) shows (in a colored plate) the corolla of the artificial hybrid to be similar in color and size to that of *V. anagallis-aquatica*.

Brooks' statement that natural hybrids in Scrophulariaceae are infrequent may be misleading. In *Veronica*, for which no hybrids were known by Brooks, we are aware of three instances of hybridization in Europe, involving six species other than *V. anagallis-aquatica* and *V. catenata* (Beatus, 1936; Hartl, 1968; Walters & Webb, 1972). Also, Hultén (1937) reports suspected hybridization between *V. stelleri* Pall. ex Spreng. and *V. wormskjoldii* Roem. & Schult. in the Aleutian Islands. Hybrids are commonly encountered in such North American genera as *Mimulus*, *Orthocarpus*, *Penstemon*, and *Castilleja*, the latter being notably promiscuous. In Europe, *Euphrasia* is equally promiscuous and hybrids are common in *Antirrhinum* and *Verbascum*. Thus natural hybrids are perhaps more frequent and certainly no more infrequent in Scrophulariaceae than in most other families of similar size.

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